What is claimed is:

1. A simulation press comprising:

a fixed main body;

a carriage associated with said main body for movement relative to said main body;

a first plate coupled to said fixed main body and being adapted to engage a workpiece comprising at least one layer;

a second plate coupled to said carriage for movement with said carriage, said second plate also being adapted to engage said workpiece;

at least one motor apparatus coupled to said fixed main body and said carriage for effecting movement of said carriage relative to said main body;

a drive controller coupled to said at least one motor apparatus for controlling the operation of said at least one motor apparatus in response to feedback from at least one feedback sensor so as to cause said second plate to move relative to said first plate such that said first and second plates engage at least one point site on said workpiece so as to simulate compression loading of a point site on a workpiece in a nip type process.

2. A simulation press as set forth in claim 1, wherein said at least one motor apparatus comprises at least one servo linear motor.

3. A simulation press as set forth in claim 2, wherein said at least one motor apparatus further comprises at least one amplifier which is coupled to said drive controller and said at least one servo linear motor.

4. A simulation press as set forth in claim 1, wherein said carriage reciprocates linearly relative to said fixed main body.

5. A simulation press as set forth in claim 1, wherein said first plate is coupled to said fixed main body via a coupling structure, said coupling structure including at least one force sensor for sensing a force generated during engagement of said workpiece by said first and second plates, said controller increasing a force generated by said at least

one motor apparatus in response to a force sensed by said at least one force sensor, said at least one force sensor comprising said at least one feedback sensor.

6. A simulation press as set forth in claim 5, wherein said at least one force sensor comprises at least one load cell.

7. A simulation press as set forth in claim 6, wherein said at least one feedback sensor further comprising a linear encoder read head coupled to said fixed main body and a sensor strip coupled to said carriage, said read head reading position values from said sensor strip and generating corresponding signals to said controller.

8. A simulation press as set forth in claim 7, wherein predetermined discrete time intervals and corresponding carriage positions are provided to said controller and said controller controlling the operation of said at least one motor apparatus so as to control the movement of said carriage based on the carriage positions provided to the controller and in response to the signals generated by said read head and said at least one load cell.

9. A simulation press as set forth in claim 8, wherein at least a portion of said carriage positions are determined via the following equation:

$$P(t) = G + Di \cdot \left[1 - \cos\left[a\cos\left(1 - \frac{E_M}{Di}\right) \cdot \left(\frac{t}{T} - 1\right)\right]\right]$$

wherein

E_M is equal to the amount by which the point site is compressed by a protuberance on the second plate and an outer surface of the first plate;

G is equal to the thickness of the compressed material;

Di is equal to the diameter of first and second rolls;

t is equal to the process time and has a value from 0 to $(T_1 + T_2)$; and

$T = T_1 = T_2$ is equal to one-half of the total time said workpiece point site is engaged by the protuberance on said second plate and the outer surface of said first plate.

10. A simulation press as set forth in claim 6, wherein said fixed main body comprises:

an outer support member;

a pair of L-shaped limiting members associated with said outer support member;

a spring-loading plate; and

a least one adjustment member associated with said outer support member and said spring-loading plate for adjusting the position of said spring-loading plate.

11. A simulation press as set forth in claim 10, wherein said coupling structure comprises:

a spring-loaded plate positioned between said spring-loading plate and said L-shaped limiting members; and

at least one compression spring positioned between said spring-loading plate and said spring-loaded plate for biasing said spring-loaded plate against said L-shaped limiting members.

12. A simulation press as set forth in claim 11, wherein said coupling structure further comprises:

a first cooling plate coupled to said spring-loaded plate;

a first heated plate coupled to said first cooling plate; and

said first workpiece-engaging plate being coupled to said first heated plate.

13. A simulation press as set forth in claim 12, wherein said at least one load cell is positioned between said first cooling plate and said first heated plate.

14. A simulation press as set forth in claim 1, wherein said carriage comprises:

a carriage main body portion;

a second cooling plate coupled to said carriage main body portion;

a second heated plate coupled to said second cooling plate; and

said second workpiece-engaging plate being coupled to said second heated plate.

15. A simulation press as set forth in claim 1, wherein said first workpiece-engaging plate has a substantially planar surface and said second workpiece-engaging plate comprises at least one protuberance and said controller controls the operation of said at least one motor apparatus such that said second plate is moved relative to said first plate so that said protuberance and said planar surface on said first plate engage said point site on said workpiece so as to compress said site to a desired thickness.

16. A simulation press as set forth in claim 15, further comprising at least one sensor associated with one of said first and second plates for sensing the distance between said first and second plates during the workpiece point site compression operation.

17. A simulation press as set forth in claim 16, wherein said at least one sensor comprises at least one electromicrometer coupled to said first plate, said electromicrometer generating signals received by a processor which determines from said signals the distance between a distal end of said protuberance and said first plate planar surface during discrete points of said workpiece point site compression operation.

18. A method of simulating compression loading of a point site on a workpiece in a nip type process comprising the steps of:

providing a workpiece comprising at least one layer;

providing a first plate having a substantially planar surface;

providing a second plate having at least one protuberance; and

moving one of said first and second plates relative to the other of said first and second plates such that said planar surface and said protuberance compress a point site on said workpiece so as to simulate compression loading of a point site on a workpiece in a nip type process.

19. A method of simulating compression loading of a point site on a workpiece in a nip type process as set forth in claim 18 further comprising the steps of:

determining the force generated by said planar surface and said protuberance on said workpiece point site at discrete points;

sensing the distance between said first and second plates at said discrete points during workpiece point site compression; and

determining load per unit area of said workpiece point site as a function of percent compression of said workpiece point site using the determined force and sensed distance at said discrete points.

20. A method of simulating compression loading of a point site on a workpiece in a nip type process as set forth in claim 18, wherein said workpiece comprises at least two layers and said moving step effects fusion bonding of said two or more layers at said workpiece point site.